Approval # | Product # 201611-W

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Wisconsin
Building Product Evaluation

Material	Steel Reinforced Laminated Composite Column (SRLCC)
Manufacturer	Jack Walters & Sons Corporation PO B 388, 6600 Midland Court Allenton, WI 53002

SCOPE OF EVALUATION

The Steel Reinforced Laminated Composite Column (SRLCC) manufactured by Jack Walters and Sons Corporation have been evaluated for use as post-frame column in accordance with the below cited International Building Code (IBC) requirements of the current Wisconsin commercial building code and Wisconsin Uniform Dwelling Code (UDC).

- **Allowable Stress Design:** The composite column designs were evaluated for use within allowable design values in accordance with **s. IBC 2306.1** and **s. IBC 2304.9.4**.
- **Wood Columns:** The wood used as upper column component of the Steel Reinforced Laminated Composite Column (SRLCC) is of 2400f-2.0E Southern Yellow Pine lumber, evaluated in accordance with **s. IBC 2303.1, 2303.1.1** and **s. IBC 602.4.1**. Wood columns in UDC structures shall meet **SPS 321.25(6)** column provisions with sizing through structural analysis.
- **Composite Steel/Plastic Column Base:** Lower portions of the Steel Reinforced Laminated Composite Column (SRLCC) are steel-reinforced plastic (SRP) base. The steel-reinforced plastic (SRP) base is comprised of a steel reinforced cage (skeleton) of steel reinforcing bars evaluated in accordance with **s. IBC 1907.1** to **s. IBC 1907.13** surrounded by a proprietary blended glass-fiber reinforced polypropylene evaluated in accordance with **s. IBC 2612.6**.

DESCRIPTION AND USE

The Steel Reinforced Laminated Composite Column (SRLCC) is an assembly of three laminates of 2x6's or 2x10's of 2400f-2.0E Southern Yellow Pine lumber upper column and lower column of steel reinforcing bar (skeleton) surrounded by glass-fiber reinforced polypropylene. The column of sawn dimensional lumber is bonded together on the wide face using metal connector plates and fasteners in staggered splices in a factory process. The staggered locations of splices in a three-ply column is such that the second outside splice is 6 inches above the shortest outside member splice and the third center splice is 24 inches above the shortest treated member. The spliced lumber is bonded together with 18 & 20 gauge G60 galvanized steel transfer plates:

- Interior transfer plates 5" wide by 32" long are 0.0362-inch thick galvanized plates that have a two tooth plug that is pressed into the SRP base and wood parallel to the grain, but having the alternating rows of vertical teeth are bent in the opposite direction (2-way). The rows of teeth are spaced 3/8-inch vertically on the plate. Spacer blocks and special pressing platen, with holes to accommodate plate teeth is used prior to first pressing. Column is turned over 180 degrees and second interior plate is placed before proceeding on to the outside wood laminations.
- Exterior 18 gage thick galvanized connector plates that have a two tooth plug was pressed into the wood parallel to the grain to reinforce the outside butt joint. Plug size is 3/16" x 1/2" resulting in each tooth embedding 1/4" into the wood. The rows of teeth are spaced vertically on the plate 2/3 of an inch. Each horizontal row has 1/4" of metal between the plugs. The plates have a wider band of metal along the vertical edges. Four 4½" long Headlock structural screws are inserted into the splice region to complete the fabrication process.

These composite columns are suitable for use in commercial & UDC buildings having shallow post foundation systems within the tested loading limitations as described below.

TESTS AND RESULTS

Column data is taken from Bohnhoff, D. R., Pederson, D. L., & Klessig, C. (2016) *Bending Properties for a Steel Reinforced Plastic-to-Wood Column Connection*. Paper Number: 2460772 St. Joseph MI: ASABE (American Society of Agricultural and Biological Engineers). That paper was written for presentation July 17-20, 2016 at the 2016 ASABE Annual International Meeting in Orlando Florida.

For the lower portion of some of its mechanically-laminated columns, Jack Walters & Sons Corporation has developed a steel-reinforced plastic base. This SRP base is spliced to the upper, laminated lumber portion of the column with a combination of truss plates and screws. The paper contains the results of a series of bending tests conducted on the plastic base-to-lumber splice region for nominal 5x6 & 5x10 inch columns. Bending strength and stiffness of the spliced region is then compared to those of the unspliced lumber region and the unspliced steel-reinforced plastic region. Goals were (1) to determine the bending strength and stiffness of the splice region of nominal 5x6 and 5x10 inch Composite Columns, and (2) to compare these

bending properties to those of the unspliced regions of the assemblies, and (in the case of the nominal 5x6 inch posts) to the unspliced plastic region of the assemblies.

All rebars were U.S. grade 60 steel with their lengths chosen to extend out of the molded plastic base to anchor the column to a cast-in-place concrete footing/collar.

Testing was performed at the Agricultural Engineering Laboratory at the University of Wisconsin-Madison, in Madison, WI during March of 2016. Where applicable and possible, those static bending tests were conducted in accordance with the flexure portions of ASTM D198 *Standard Test Methods of Static Tests of Lumber in Structural Sizes*. Nominal 5x10 inch specimens were tested on March 1 and 2 and nominal 5x6 inch specimens on March 22 and 23. The splice region and the unspliced region of each of 15 specimens were loaded to failure in bending using identical two-point arrangements. All columns were loaded in a direction parallel to the wide face of each lamination. To facilitate two tests on the same specimen, extra-long column was positioned to hang over one of the supports with a counter-balanced weight. The splice region was tested first, and then the unspliced region was tested. Once all of the 5x6 inch specimens were tested, five of the SRP bases were cut off and then were loaded to failure using a single, center-point loading system. A structural steel tube was tested to provide a control for displacements and deformations of the load application system and support reactions.

The resulting conclusions were drawn from the tests and analysis of test results:

1. The splice region of nominal 5x6 inch and nominal 5x10 inch Composite Columns can be assigned a design bending strength (load duration 10 minutes) of 1.05E+05 lbf-in (11.9 kN-m) and 2.67E+05 lbf-in (30.2 kN-m) respectively.
2. Unspliced SRP region of nominal 5x6 inch Composite Columns can be assigned a design bending strength (load duration 10 minutes) of 1.10E+05 lbf-in (12.5 kN-m).
3. The bending strength of the splice region of Composite Columns is roughly between 65% and 70% of the bending strength of the unspliced wood region of the same columns when 2400f-2.0E Southern Pine lumber is used in the assemblies.
4. Ultimate splice region bending strength was associated with the propagation of strand fractures in the steel plates used to reinforce butt joints in outer laminations.
5. Due to the manner in which splice regions failed, the bending strength of the splice region was not significantly influenced by the bending strength of the lumber used in the assemblies.
6. For modeling purposes, the SRP region and the splice region of nominal 5x6 Composite Columns should be assigned effective modulus of elasticity values of 9.6E+05 lbf-in (6.6 GPa) and 1.69E+05 lbf-in (11.6 GPa) respectively. The modulus of elasticity of the splice region is applicable to the 44 inch (112 cm) length in which the overall 24 inch (61 cm) staggered butt joint arrangement is centered.

LIMITATIONS OF APPROVAL

The **IBC** limitations below are in accordance with the current **Wisconsin Amended ICC Code:**

The Steel Reinforced Laminated Composite Column (SRLCC) can be used as an alternative to solid-sawn posts or other plied treated-wood columns used in post-frame buildings.

This approval is only for the allowable design values of the 5x6 or 5x10 nominal columns indicated in the above conclusions shown in the TESTS AND RESULTS section.

Steel Reinforced Laminated Composite Columns are approved for use in Type V construction.
The Steel Reinforced Laminated Composite Columns are approved for use where Heavy Timber (HT) Type IV construction is used in accordance with **s. IBC 602.4.1** and **602.4.7**.
The Steel Reinforced Laminated Composite Columns are approved for use in Types I and II construction, in accordance with **s. IBC 603.1, Exception 19**.
NOTE: An additional thickness of lumber shall be applied to obtain the minimum nominal 6x8 (5½" x 7½" actual) size requirement for columns supporting roofs and nominal 8x8 (7½" x 7½" actual) size requirement for columns supporting floors.

Complete structural calculations shall be submitted for each project on a site-by-site basis when the Steel Reinforced Laminated Composite Columns are used. Such values must be adjusted for bored holes or other column alterations within those regions noted above for any added stresses.

The column size and lumber grade needed shall be determined by the design load requirements of **IBC Chapter 16**.

The metal connector plates shall be permanently marked for identification. The use of the 18- & 20-gauge connectors with pressure or fire retardant treated lumber is beyond the scope of this approval.

The composite plastic base shall project at least 8-inches above exposed grade, and at least 1-inch above any concrete floor in contact with the column.

All columns of this configuration and specification must bear a stamp stating Plated Columns Patent No. : US9234350 in a visible location.

The columns must be installed in accordance with the manufacturer's installation recommendations.

DISCLAIMER

This approval will be valid through December 31, 2021, unless manufacturing modifications are made to the product or a re-examination is deemed necessary by the department. The Wisconsin Building Product Evaluation Number must be provided when plans that include this product are submitted for review. This approval addresses only the specified applications for the product and does not waive any code requirement not specified in this document.

Reviewed by: *Jack A. Miller*
Commercial building plan examiner

Approval Date: October 4, 2016 By: Jack A. Miller